Lassonde School of Engineering
Department of Earth and Space Science and Engineering
Geomatics Engineering

LE/ESSE 4650 – Hydrography
Winter 2022

LAB # 2: Tides, Datums and Echo sounding (100)

Assigned: **January 28, 2022**
Due: **February 11, 2022**

Objective:
The objective of this lab is to acquaint students with topics in tides, vertical datums, single beam echo sounders and Ellipsoidally Referenced Hydrographic Surveys.

Question 1 (20)
Using resources from textbooks, websites, and journal articles for research, in your own words, differentiate between analogue and digital echo sounders, including operation details during surveying and possible advantages/disadvantages between both systems.

Question 2 (20)
2.1) On a small surveying vessel, a single beam echo sounder emits a 36 m long beam from its transducer to the seafloor. The width of the beam is 6.7°. Determine the resultant footprint size on the seafloor.
2.2) From a slant distance of 48 m, using the same beam width from (2.1), another measurement was made by the echo sounder on a sloping seafloor with an inclination of 10.2° deviating from its horizontal plane. Describe and quantify the source of error which affects your depth measurement.

Question 3 (25)
Using tide tables, you are required to determine the height of the water level (in feet) with respect to a chart depth of 13.7 feet for a secondary port (Hooper Island, Md.) at a given time of 9:35 AM on Feb 14, 2017 (in EST). You are required to adequately illustrate each step in the calculation process undertaken (e.g., using print screens of data referred from tide tables, etc.).

Question 4 (20)
Prior to conducting a hydrographic survey in Lake Ontario (which is one of five lakes belonging to the Great Lakes), you are tasked with delivering information to your survey crew, which requires you to conduct some research. Using resources from textbooks, websites and journal articles, in your own words, answer and discuss the following:
4.1) What is the vertical datum used for the Great Lakes, including its relation with the North American Datum and historical aspects of previously used datums on these lakes?
4.2) What is the height system used in the Great Lakes and its relation with orthometric heights?

Question 5 (15)
Determine the Reduced Depth to Chart Datum using the Ellipsoid as vertical reference for sea floor hydrographic survey in a region with tidal effect. Given:

h	Ellipsoidal height of the GPS antenna	45m
ZA	Offset between GPS antenna and vessel's reference point	10m
D	Observed depth (corrected for errors and heave)	40m
DD	Dynamic Draught	2m
ZT	Transducer offset	1m
SEP	Separation	56m

Provide a diagram illustrating the geometry of the components of the vertical position and supporting your solution.

Submission of lab report
The lab report must address each question, describe the steps of the work, and provide the findings and answers for each question. Include title page and scope of this exercise. The lab report should include: description and explanations of the details of the steps and mathematical expressions/formulae used, illustration of computations and results obtained. All code/scripts created and used should also be included in the submitted reports. Citations/references must be provided when using external sources (e.g., books, web, journal papers) for research. Make sure to reference your sources. Use appendices when necessary. It must be a professional report. Pay attention to structure, syntax, grammar, spelling, and presentation. Digital versions of the report are to be submitted.